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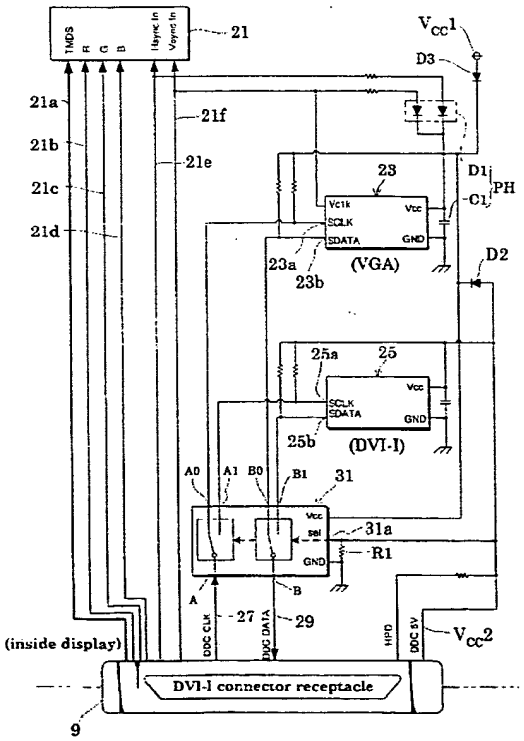
## (54) Display apparatus

(57) A display apparatus for displaying images based on signals received from a host. The apparatus includes a determining means for determining an interface type of the host, a plurality of storage means each storing specification information relating to display for one of interface types to be connected, and an output means for outputting, from one of the storage means to the host, the specification information corresponding to the interface type determined by the determining means.

Fig.2

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[0016] In this case, the output means outputs appropriate specification information corresponding to the interface type, whichever is employed by the host, so that images can be displayed properly according to the specification of the display apparatus.

## BRIEF DESCRIPTION OF THE DRAWINGS

[0017] For the purpose of illustrating the invention, there are shown in the drawings several forms which are presently preferred, it being understood, however, that the invention is not limited to the precise arrangement and instrumentalities shown.

[0018] Fig. 1 is an overall view of a computer system including a display apparatus according to this invention;

[0019] Fig. 2 is a block diagram of a principal portion of the display apparatus; and

[0020] Fig. 3 is a view showing a conversion cable.

## DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0021] Preferred embodiments of the present invention will be described in detail hereinafter with reference to the drawings.

[0022] Referring to Fig. 1, a computer 1 has a keyboard 3 and a mouse 5 connected thereto for inputting instructions and the like. The computer 1 outputs images and other data to a display 8 through a graphics card 7 inserted into an extended slot of the computer 1. The display 8 has a receptacle 9 formed adjacent to the rear thereof for receiving a DVI-I connector for the DVI-I interface.

[0023] The graphics card 7 corresponds to the host of this invention. This graphics card 7 may be the VGA interface type, or the DVI-I interface type.

[0024] Where the interface type is different, signals from the graphics card 7 and a voltage to a DC power line are different. Specification information called EDID is also different, which is outputted from the display 8 to the graphics card 7 to allow proper display of images on the display 8. The EDID acts on the OS of computer 1 most effectively where the OS supports the Plug-and-Play function.

[0025] Where, for example, the graphics card 7 employs the VGA interface and the display 8 employs the DVI-I interface, the graphics card 7 and display 8 must be connected through a conversion cable 13 having, at both ends thereof, a VGA connector acting as a receptacle 10 and a DVI-I connector acting as a plug 11. The DVI-I connector 11 has a 5V line for DDC (Display Data Channel) which is grounded as described hereinafter.

[0026] Where both the graphics card 7 and the display 8 employ the DVI-I interface, the graphics card 7 and display 8 may be connected through a usual video cable, i.e. one for the DVI-I interface.

[0027] The display 8 includes a display screen such as a liquid crystal display screen, and an ASIC 21 for controlling this display screen (Fig. 2). The ASIC 21 has a TMDS signal line 21a which is a digital signal line, RGB signal lines 21b-21d, a horizontal synchronizing signal line 21e and a vertical synchronizing signal line 21f, all extending from the DVI-I connector receptacle 9 to the ASIC 21. Through this ASIC 21 signals are exchanged between various components (not shown) of the display 8.

[0028] The display 8 includes two EDID storage memories 23 and 25 which correspond to the storage means of this invention. The EDID storage memory 23 is for the VGA interface and the EDID storage memory 25 is for the DVI-I interface . These memories 23 and 25 store EDID corresponding to the respective interfaces. Synchronously with a clock from a DDC clock line 27 received at serial clock terminals 23a and 25a, the memories 23 and 25 output the EDID from serial data terminals 23b and 25b to a DDC data line 29.

[0029] The storage means are not limited to the two EDID storage memories 23 and 25. The number of memories may be varied with the number of interface types to be accommodated. Each memory may be selected for each interface type by a multiplexer 31.

[0030] The serial clock terminals 23a and 25a of EDID storage memories 23 and 25 are connected to input terminals A0 and A1 of multiplexer 31. The serial data terminals 23b and 25b are connected to input terminals B0 and B1 of multiplexer 31. Output terminals A and B of multiplexer 31 are selectively connected to the input terminal A0 or A1 and the input terminal B0 or B1, respectively, according to a voltage at a selector terminal 31a. In this embodiment, when the voltage at the selector terminal 31a is "0V" or thereabout, the output terminals A and B are connected to the input terminals A0 and B0, respectively. When the voltage is "5V" or thereabout, the output terminals A and B are connected to the input terminals A1 and B1, respectively.

[0031] The multiplexer 31 corresponds to the determining means and output means of this invention.

[0032] A power line Vccl, which is connected to the primary source of display 8 for supplying 5V DC voltage, is connected to the EDID strage memory 23 and to the multiplexer 31 through a backflow preventing diode D3 which prevents reverse flow of current. Power is constantly supplied to the EDID storage memory 23 and multiplexer 31 during the operation of the display 8, including the operation in a power save mode. The horizontal synchronizing signal line 21e and vertical synchronizing signal line 21f are connected to the power terminal of EDID storage memory 23 through a rectifier diode D1. The rectifier diode D1 forms a peak hold circuit PH in combination with a capacitor C1 connected between the power terminal and a grounding terminal. That is, when the power line Vcc1 is at "0V", power needed for the operation is obtained from the graphics card 7.

[0033] A power line Vcc2 (5V line for DDC) is connect-

**[0050]** The present invention may be embodied in other specific forms without departing from the spirit or essential attributes thereof and, accordingly, reference should be made to the appended claims, rather than to the foregoing specification, as indicating the scope of the invention.

**[0051]** A display apparatus for displaying images based on signals received from a host. The apparatus includes a determining means for determining an interface type of the host, a plurality of storage means each storing specification information relating to display for one of interface types to be connected, and an output means for outputting, from one of the storage means to the host, the specification information corresponding to the interface type determined by the determining means.

## Claims

1. A display apparatus for displaying images based on signals received from a host, comprising:

   determining means for determining an interface type of said host;
   a plurality of storage means each storing specification information relating to display for one of interface types to be connected; and
   output means for outputting, from said storage means to said host, the specification information corresponding to the interface type determined by said determining means.

2. A display apparatus as defined in claim 1, wherein said determining means is arranged to determine the interface type based on a voltage value of a particular DC power line among signal lines from said host.

3. A display apparatus as defined in claim 2, wherein said output means comprises a multiplexer for selectively switching the connection to one of said plurality of storage means in response to said voltage value of said DC power line.

4. A display apparatus as defined in claim 1, wherein said determining means is arranged to discriminate between the DVI-I (Digital Visual Interface Integrated) interface and the VGA (Video Graphics Adapter) interface.

5. A display apparatus as defined in claim 1, wherein said plurality of storage means comprise two storage means, one for the DVI-I interface, and the other for the VGA interface, said storage means for the DVI-I interface being powered by said host only when the interface type is the DVI-I interface.

6. A display apparatus as defined in claim 5, further comprising a peak hold circuit for generating a DC voltage based on synchronizing signals received from said host, said DC voltage generated by said peak hold circuit being supplied only to said storage means for the VGA interface and to said multiplexer.

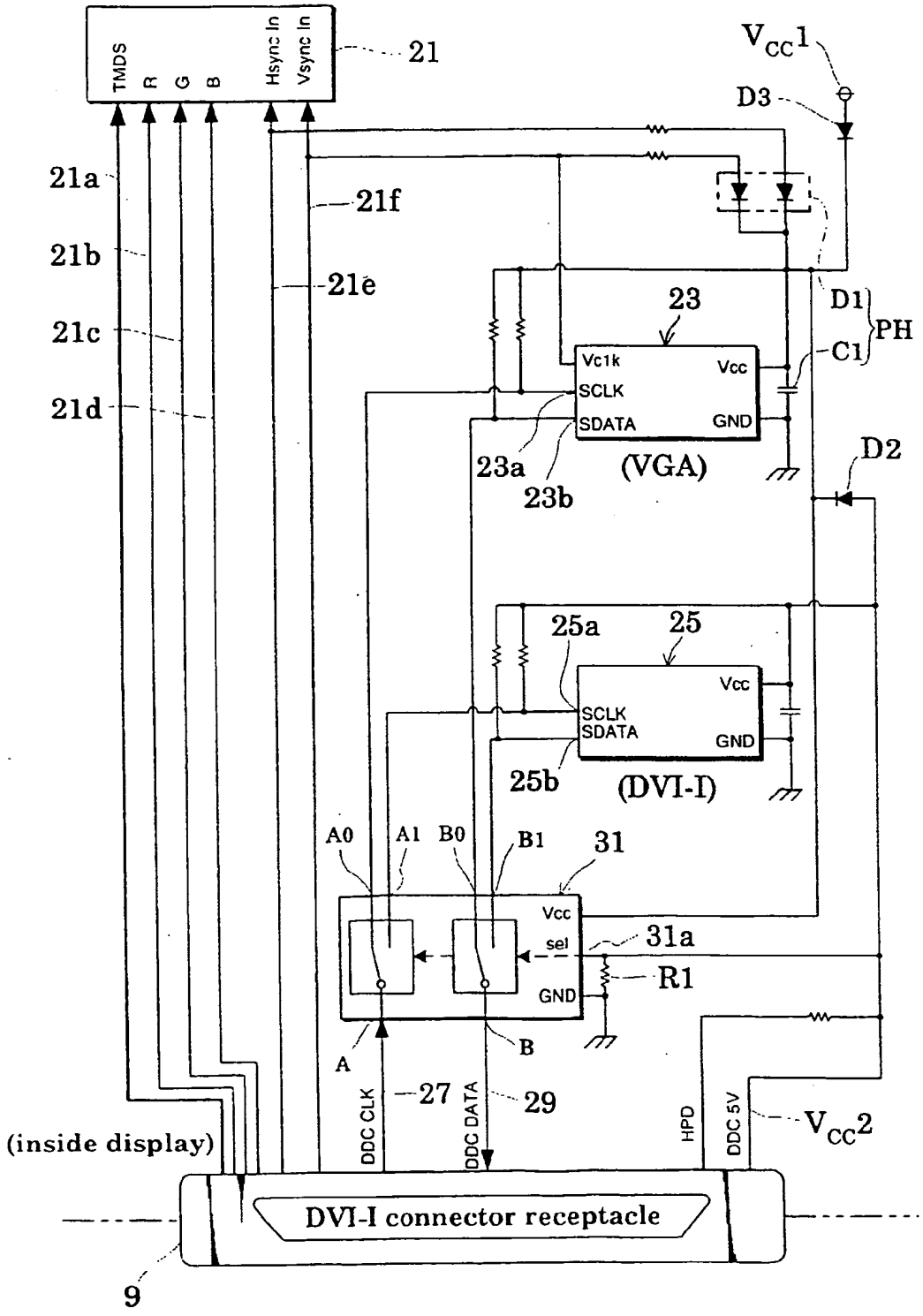
7. A display apparatus as defined in claim 6, further comprising a backflow preventing diode disposed between said peak hold circuit and said storage means for the DVI-I interface for blocking a DC current flowing from said peak hold circuit.

8. A display apparatus as defined in claim 4, wherein said display apparatus is connected to said host through a VGA to DVI-I conversion cable having, at its DVI-I end, a 5V line for DDC (Display Data Channel) which is opened or grounded.

9. A display apparatus as defined in claim 1, wherein said specification information is EDID (Extended Display Identification Data) necessary for the Plug-and-Play function.

10. A display apparatus as defined in claim 2, wherein said specification information is EDID necessary for the Plug-and-Play function.

Fig.2



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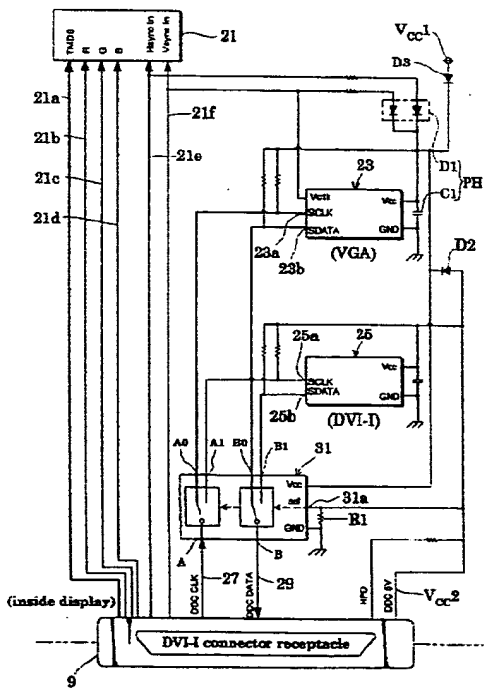


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## ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 00 12 8013

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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03-05-2002

| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
|---|---|---|---|
| JP 11231994 A | 27-08-1999 | NONE | |
| US 5764547 A | 09-06-1998 | NONE | |

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82